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MONTHLY
MICROCLIMATIC SUMMARY

MAY 1967

ENVIRONMENTAL DATA BASE
FOR REGIONAL STUDIES IN THE HUMID TROPICS

USATECOM Project No 9-4-0013-01

US ARMY
TROPIC TEST CENTER
Fort Clayton, Canal Zone

Sponsored by

Advanced Research Projects Agency, ARPA Order No. 740

Army Research Office, OCRD, Project No. 2M025001A724 01

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FOR REGIONAL STUDIES IN THE HUMID TROPICS

MONTHLY
MICROCLIMATIC SUMMARY

MAY 1967

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USATECOM Project No. 9-4-0013-01

This research was supported by the Advanced
Research Projects Agency of the Department
of Defense and by the Army Research Office,
OCRD, Department of Army

Conducted by

US Army
Tropic Test Center
Fort Clayton, Canal Zone
with contractual services provided by
Weather Engineers of Panama Corp.

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MONTHLY MICROCLIMATIC SUMMARY

Introduction

Monthly microclimatic data summarized in this series of reports were collected by the US Army Tropic Test Center and the Weather Engineers of Panama Corporation under the project, Environmental Data Base for Regional Studies in the Humid Tropics. The project is sponsored by the Advanced Research Projects Agency of the Department of Defense and by the Army Research Office, Office of the Chief of Research and Development. It is an investigation of microclimatic, air chemistry, vegetation, soils, microbiological, and macrofaunal conditions at selected sites in the principal tropical environments of the Panama Canal Zone and the Rio Hato Military Reservation. The objective of the project is to assemble quantitative environmental data for RDT&E purposes.

Sites. Data summarized in this report were collected at the Albrook Forest and Chiva Chiva sites. Figure 1 shows the site locations within the Isthmus of Panama. Geographic coordinates are shown below:

Albrook Forest	09° 01'N, 79° 33'W
----------------	--------------------

Chiva Chiva	09° 01'N, 79° 35'W
-------------	--------------------

The Chiva Chiva open site and the Albrook Forest site are paired for comparative study of environmental conditions in a tropical semideciduous forest and in a large clearing. Both are located in a region where the annual precipitation is approximately 80 inches and there is a pronounced dry season.

The Albrook and Chiva Chiva main sites are approximately four kilometers apart. Each has a 46-meter walk-up tower and an air-conditioned building to house the recording equipment and observers. Both sites are approximately 30 meters above sea level. The top of the forest canopy at the Albrook site is about 26.5 meters above the ground.

Instrumentation. A wide range of climatic elements are measured at the Albrook and Chiva Chiva sites. Types of observations and frequencies are shown on Figure 2. The towers at the Albrook and Chiva Chiva sites are similarly oriented. Sensing equipment is mounted at several levels on the towers to provide measurements through the vertical profile. Additional instruments are emplaced in the immediate vicinity on or near the ground. All instrument exposures are duplicated at each site. Figures 3, 4, and 5 show the instrument array at these sites.

Data Reduction and Storage. All data, as applicable, are recorded at or reduced to each full hour and transposed to punch cards. These punch cards, together with all raw data, are stored in the Tropic Test Center Technical Library Annex.

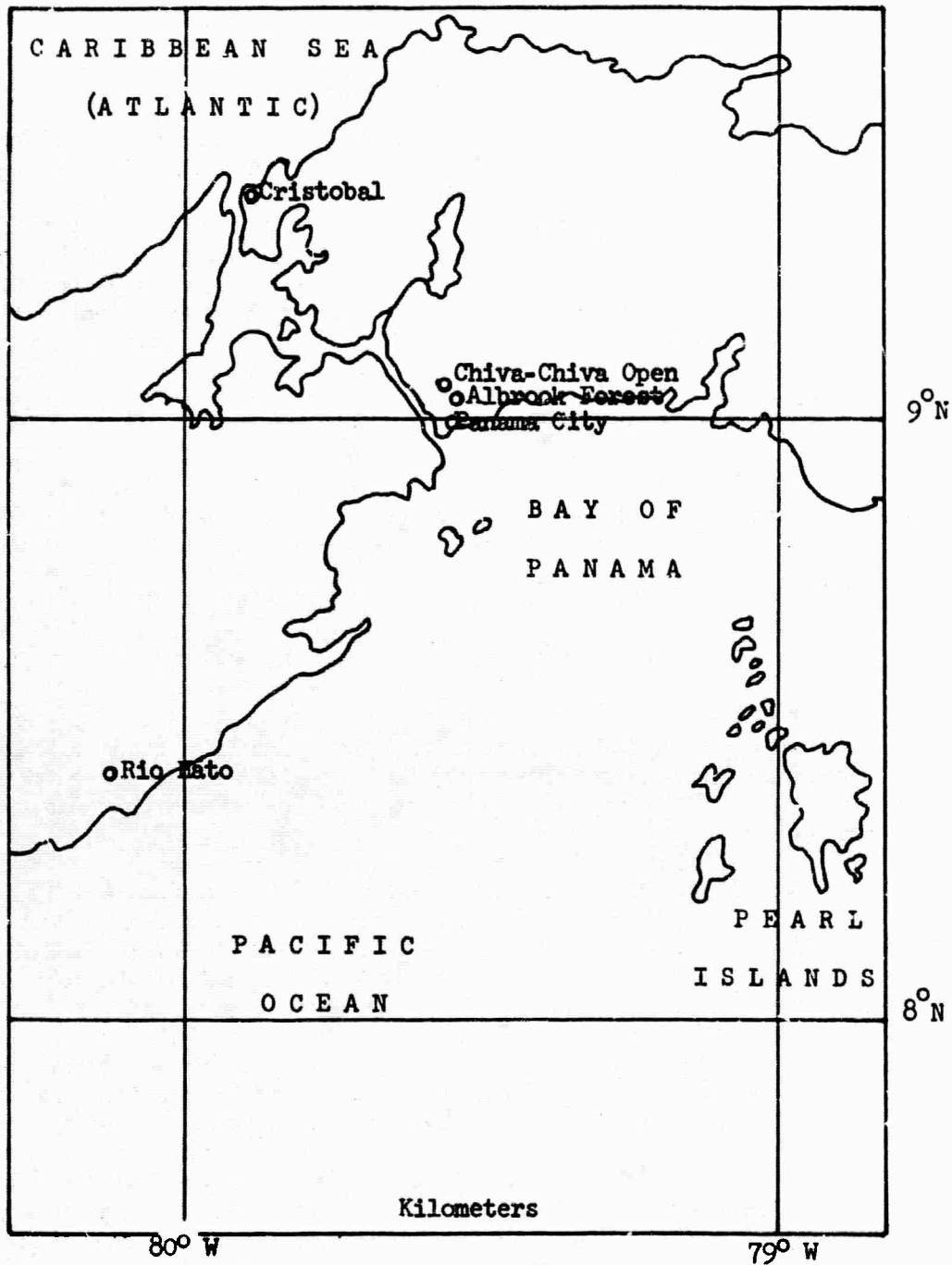


FIGURE 1. LOCATION MAP, ISTHMUS OF PANAMA

FIGURE 2. FREQUENCY OF OBSERVATIONS

# Element	Height (meters)									Frequency
	Sfc	0.5	1.0	2.0	4.0	8.0	13.5	26.5	46.0	
Temperature:										
Dry Bulb	1	1	1	1	1	-	1	1	1	Hourly*/Continuously
Wet Bulb	-	1	-	1	1	-	-	-	-	Hourly*/Continuously
Grass Minimum	3	-	-	-	-	-	-	-	-	Once Daily
WBGT Index	-	-	1	-	-	-	-	-	-	Hourly (0600-1900 EST)
Relative Humidity	-	1	1	1	1	-	1	1	1	Hourly*/Continuously
Barometric Pressure	-	-	1	-	-	-	-	-	-	Continuously
Evaporation	1	-	-	-	-	-	-	2	2	Once Daily
Precipitation:										
Recording Gage	-	-	1	-	-	-	-	-	2	Continuously
Manual Gage	-	-	2	-	-	-	-	-	-	4 Times Daily
Stream Flow	-	-	2	-	-	-	-	-	-	4 Times Daily
Wind:										
Direction	-	-	-	-	1	-	-	1	1	Continuously
Speed	-	-	-	3**	1	-	3**	1**	1	Hourly**/Continuously

1. Albrook and Chiva Chiva
2. Albrook only
3. Chiva Chiva only

* Observations made with sling psychrometer when recorders are inoperative.

** Hourly

Instrument descriptions are contained in the Environmental Data Base semiannual reports.

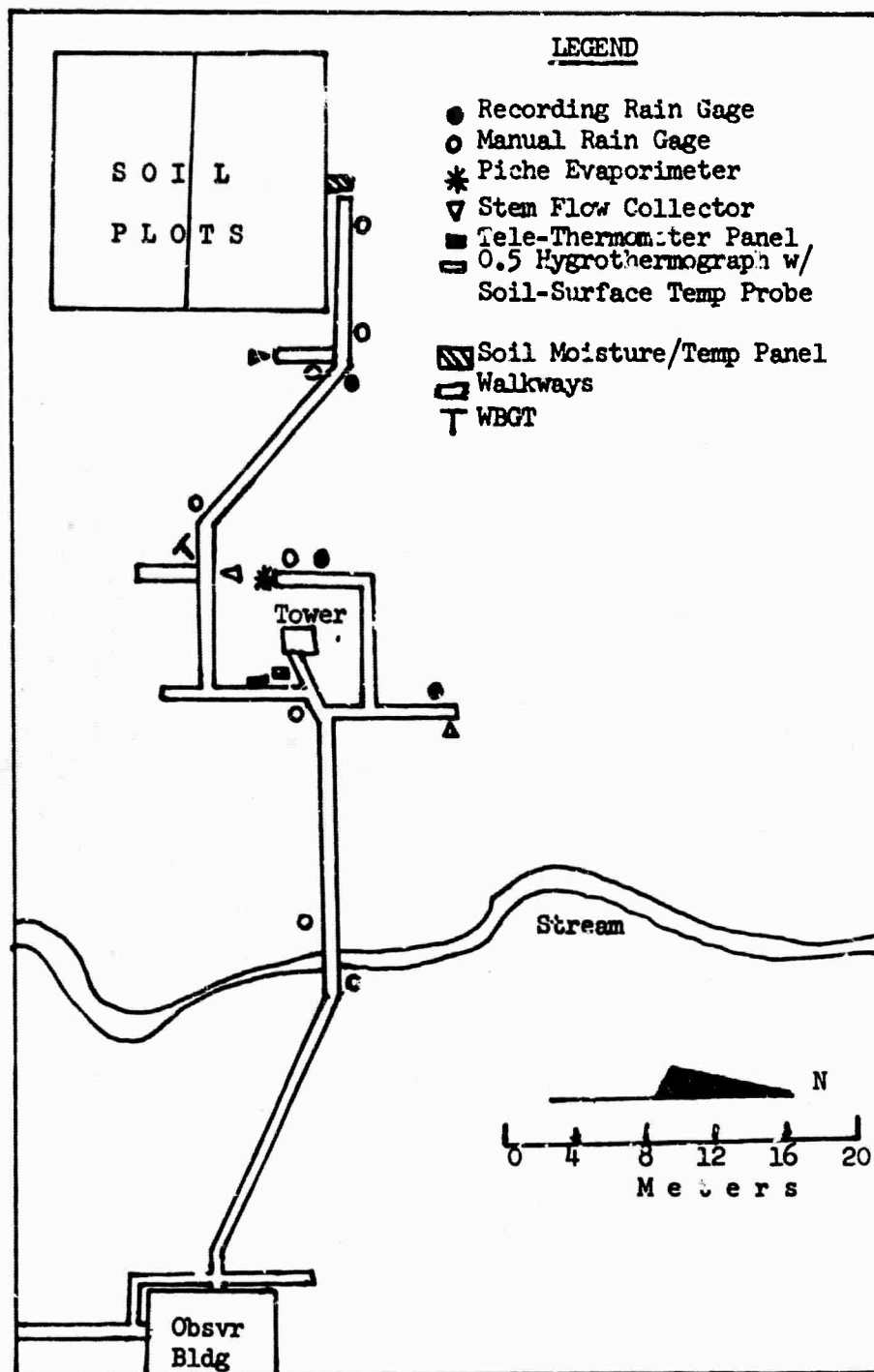


FIGURE 3. ALBROOK FOREST SITE, GENERALIZED PLOT

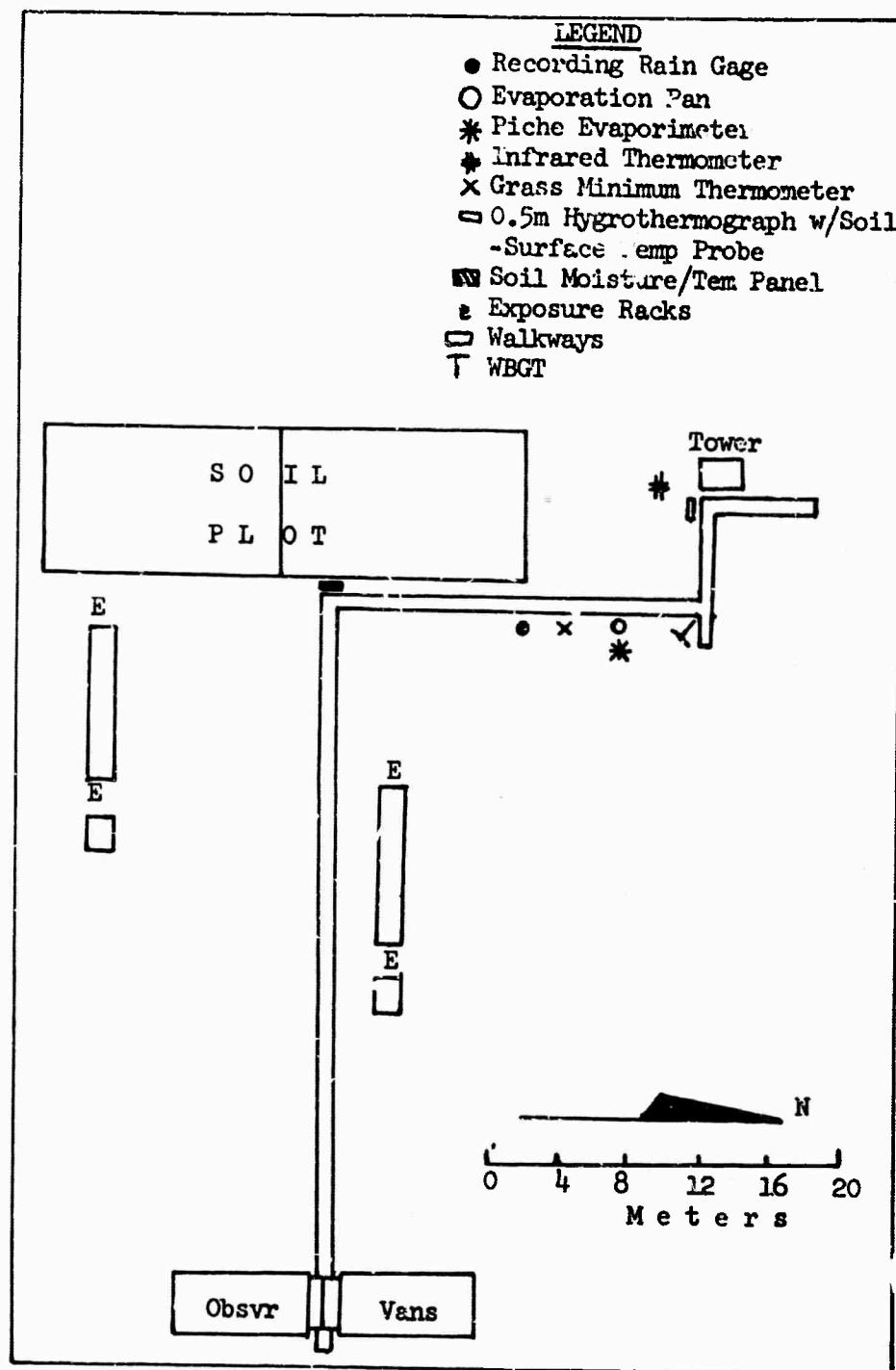


FIGURE 4. CHIVA CHIVA OPEN, GENERALIZED PLOT

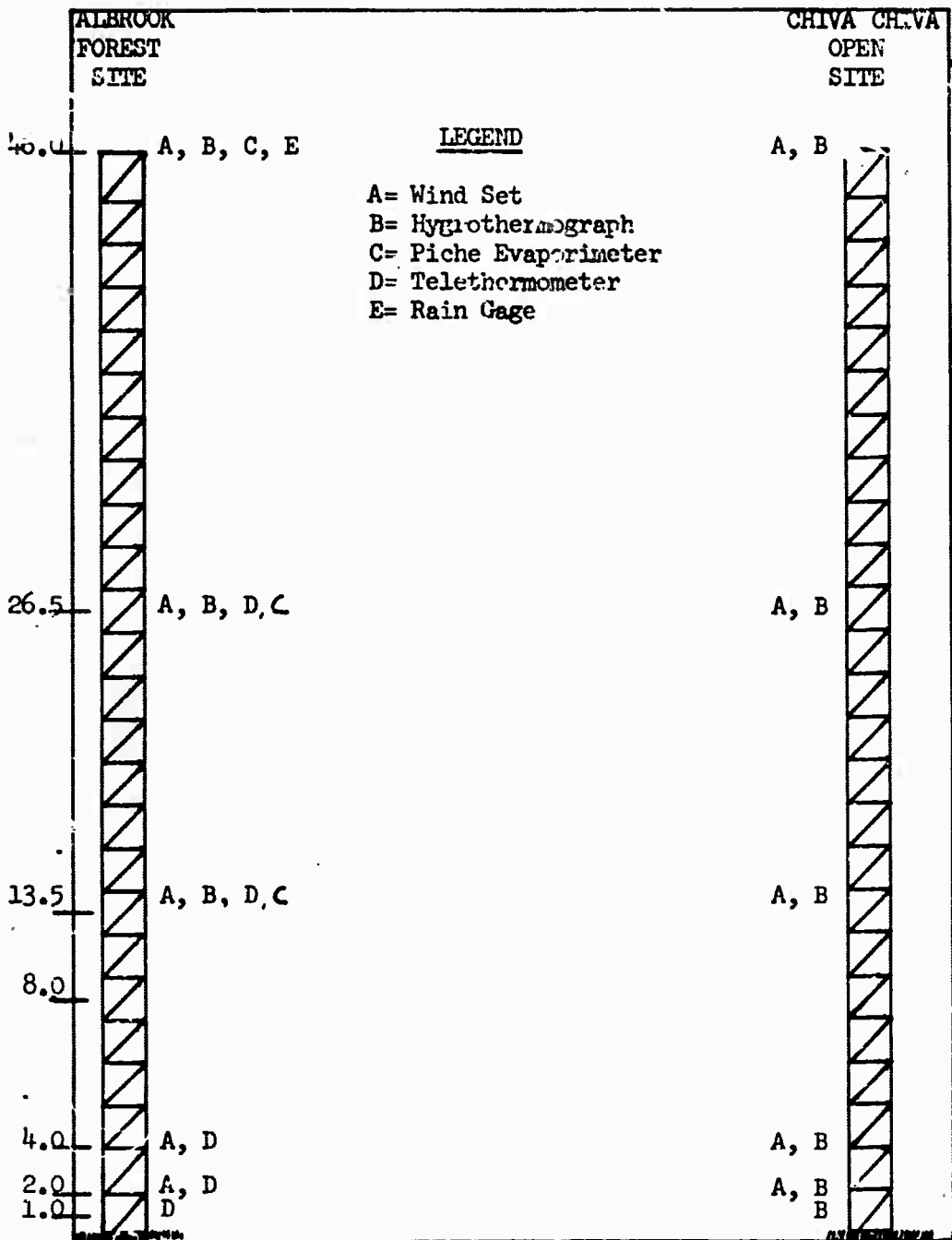


FIGURE 5. INSTRUMENT LOCATION ON TOWER

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MAY 1967

Exposure	Monthly Means of Air Temperature by Hour (° F)																								Monthly Summary												
	Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Mean	Max.							
Albrook (Forest site)	46.0 m		76.4	76.3	76.3	76.0	75.9	76.0	76.9	79.0	82.6	85.0	85.9	85.5	84.7	83.2	82.2	81.5	81.6	80.2	78.6	77.6	77.6	77.5	77.4	77.2	76.8	469	73.0	79.6	90.1						
	28.5 m								This level was not instrumented for air temperature at this time																												
	26.5 m		75.8	75.6	75.5	75.2	75.1	75.0	76.5	78.8	82.1	84.0	85.1	85.0	84.7	83.7	82.6	81.6	80.9	79.3	77.6	77.0	76.7	76.5	76.3	76.0	740	72.3	79.0	89.7							
	13.5 m		75.3	75.1	74.8	74.5	74.4	74.3	75.2	77.5	79.7	81.5	82.9	83.3	83.3	82.2	81.5	80.9	80.3	79.0	77.7	76.9	76.6	76.3	75.9	75.6	741	70.9	78.1	87.9							
	8.0 m								This level was not instrumented for air temperature at this time																												
Albrook (Forest site)	4.0 m		74.8	74.6	74.3	74.3	74.0	73.9	75.1	77.5	80.0	81.7	82.7	83.1	82.6	81.9	81.5	80.5	79.9	78.6	77.1	76.5	76.1	75.8	75.6	75.2	744	70.5	77.8	89.5							
	2.0 m		74.7	74.6	74.3	74.2	74.0	73.5	75.0	77.2	79.6	81.3	82.3	82.9	82.5	81.7	81.4	80.3	79.7	78.3	76.9	76.4	75.9	75.7	75.5	75.1	744	68.3	77.6	89.0							
	1.0 m		75.0	74.9	74.7	74.5	74.4	74.0	74.9	77.3	79.2	81.2	82.1	83.1	82.5	81.3	81.2	80.4	79.8	78.4	77.0	76.7	76.4	75.9	75.7	75.3	738	70.6	77.8	88.9							
	0.5 m		75.0	74.9	74.7	74.5	74.4	74.3	75.0	76.9	78.8	80.6	81.8	82.4	82.0	81.3	81.3	80.6	79.7	78.9	77.6	76.9	76.5	76.2	75.7	75.4	730	70.9	77.7	87.0							

Chiva Chiva (Open site)	45.0 m	76.5	76.3	76.0	75.9	75.8	75.9	77.5	80.0	82.1	83.7	84.4	84.0	83.5	82.4	81.3	81.0	80.3	79.6	78.3	77.9	77.5	77.3	77.1	76.5	744	72.2	79.2	90.0
	28.5 m	This level was not instrumented for air temperature at this time																											
	26.5 m	76.4	76.2	75.9	75.8	75.6	75.5	77.4	80.0	81.8	83.1	84.1	84.0	83.6	82.6	81.8	81.4	80.6	79.8	78.5	77.9	77.5	77.3	77.0	76.8	744	72.3	79.2	89.8
	13.5 m	76.2	76.0	75.7	75.6	75.4	75.3	77.4	80.2	82.1	83.9	84.7	84.4	84.1	83.0	82.0	81.6	80.7	79.8	78.4	77.9	77.4	77.2	76.3	76.6	744	71.5	79.3	90.3
	8.0 m	This level was not instrumented for air temperature at this time																											
Chiva Chiva	4.0 m	75.8	75.5	75.1	75.0	74.8	74.7	77.7	80.5	82.6	84.9	85.7	86.1	85.0	84.3	83.0	82.6	81.6	80.0	78.3	77.5	77.0	76.6	76.6	76.3	741	70.4	79.5	90.9
	2.0 m	75.4	75.1	74.8	74.6	74.5	74.5	77.7	80.6	82.7	85.0	85.8	86.0	85.1	84.2	83.0	82.5	81.5	79.9	78.1	77.3	76.8	76.3	76.3	76.0	741	70.4	79.3	90.7
	1.0 m	75.5	75.3	75.0	74.8	74.6	74.4	77.8	81.0	83.2	85.5	86.1	86.0	85.3	84.3	83.5	83.4	82.2	80.4	78.6	77.7	77.1	76.6	76.3	76.0	744	70.0	79.6	92.2
	0.5 m	75.5	75.2	74.9	74.8	74.6	74.6	76.7	80.2	83.0	85.3	86.1	86.6	85.5	84.6	83.8	83.3	82.2	80.5	78.4	77.5	76.9	76.5	76.1	75.9	737	70.3	79.5	93.5

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MAY 1967

Exposure		Monthly Ranges of Air Temperature by Hour (°F)																								Monthly Summary*	
Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Albrook (Forest site)	46.0 m	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF		
	28.5 m	This level was not instrumented for air temperature at this time																									
	26.5 m	4.1	3.7	3.8	4.8	4.2	4.9	5.4	7.2	11.7	11.1	11.4	15.0	13.7	14.0	14.9	14.5	13.8	10.1	5.6	5.5	4.0	4.1	5.2	4.7		
	13.5 m	5.7	5.5	5.2	6.1	6.8	7.3	8.0	8.5	9.8	11.5	12.5	12.5	11.1	12.0	12.9	13.0	12.7	9.8	6.9	5.0	4.2	5.1	5.9	5.7		
	8.0 m	This level was not instrumented for air temperature at this time																									
	4.0 m	5.7	7.2	6.6	6.5	6.5	5.8	4.8	4.4	5.1	9.5	11.9	13.7	11.5	11.2	15.2	11.8	11.8	9.1	6.3	5.4	6.2	5.5	5.7	4.9		
	2.0 m	4.8	6.4	6.4	6.5	6.7	5.9	5.0	5.7	3.8	9.0	10.7	13.1	11.3	11.2	14.7	11.5	11.5	8.2	6.0	5.4	6.0	5.5	5.7	4.8		
	1.0 m	5.0	5.7	6.1	6.3	6.6	5.8	4.7	6.6	7.5	10.6	9.9	12.8	12.8	10.8	14.4	12.5	11.2	8.3	6.0	4.8	5.5	5.2	5.0	4.7		
	0.5 m	5.0	5.8	5.5	6.3	6.6	6.1	5.1	5.9	7.2	8.7	9.9	9.7	10.1	10.7	11.8	11.2	DTF	8.5	6.4	4.7	4.6	4.6	4.8	5.3		

Note: DTF Indicates data of doubtful validity.

* No monthly summary was computed for the ranges.

Chlva Chlva (Open site)	46.0 m	4.7	4.4	5.1	5.8	6.1	6.9	7.1	7.5	9.1	9.3	10.4	16.2	14.4	12.4	13.0	11.3	10.2	7.9	5.8	4.5	3.5	3.3	3.1	2.9		
	28.5 m	This level was not instrumented for air temperature at this time																									
	26.5 m	5.2	5.4	5.9	5.9	6.3	6.1	7.4	7.5	9.3	9.5	10.4	14.6	13.7	12.4	11.9	10.8	10.5	7.4	5.0	4.3	3.4	3.2	3.7	4.4		
	13.5 m	6.5	5.5	5.9	6.3	6.8	7.0	7.8	7.1	9.2	10.3	10.3	14.6	15.1	13.5	12.0	11.0	10.7	8.0	5.8	4.5	3.6	3.3	3.7	4.1		
	8.0 m	This level was not instrumented for air temperature at this time																									
	4.0 m	7.5	7.5	6.6	7.0	7.7	8.0	7.0	6.5	9.1	10.0	11.2	15.8	14.1	14.4	13.3	12.8	13.1	9.0	7.2	5.2	4.5	4.5	5.2	5.6		
	2.0 m	7.9	7.6	6.9	7.1	7.4	7.8	7.3	6.4	9.1	9.1	11.1	15.2	14.3	14.3	13.7	12.9	12.8	8.8	6.3	5.1	3.6	4.2	4.1	5.2		
	1.0 m	8.3	8.5	7.4	7.6	8.0	8.1	7.9	8.0	11.9	13.6	13.3	17.2	16.0	16.5	16.8	15.9	13.3	9.2	6.5	5.4	4.7	4.3	4.5	4.9		
	0.5 m	7.7	7.3	7.0	7.6	7.7	7.6	8.4	7.1	11.1	14.4	15.5	17.2	15.2	14.8	15.1	13.5	13.7	9.4	6.7	4.0	3.9	4.1	5.7	5.2		

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MAY 1967

Exposure	Monthly Means of Relative Humidity by Hour (%)																								Monthly Summary								
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No of obs.	Min.	Mean	Max.					
Site: Level																																	
Albrook (Forest site)	46.0 m	91	92	92	92	92	89	84	76	69	68	69	73	75	79	81	81	83	86	87	89	90	90	90	90	614	53	85	97				
	28.5 m							This level was not instrumented for relative humidity at this time																									
	26.5 m	93	93	94	93	93	94	91	85	77	72	71	71	74	77	79	81	81	84	88	89	91	91	92	92	742	54	85	99				
	13.5 m	95	95	95	95	96	94	90	84	78	76	76	77	80	81	83	83	85	87	89	90	92	94	94	94	741	54	88	99				
	8.0 m							This level was not instrumented for relative humidity at this time																									
4.0 m	96	97	97	97	97	98	95	93	85	81	80	79	81	85	84	86	86	89	91	93	94	95	95	96	96	744	58	90	100				
2.0 m	97	97	97	97	97	98	96	94	87	84	82	80	81	85	85	87	88	91	92	93	94	95	95	96	96	744	52	91	100				
1.0 m	97	97	97	97	97	98	97	95	91	87	83	81	82	85	86	87	88	90	92	93	94	96	96	96	96	733	60	92	100				
0.5 m	97	97	97	97	97	98	97	96	92	90	87	84	86	88	88	89	92	91	92	94	94	96	96	96	96	728	62	93	100				

46.0 m	90	91	92	92	92	92	67	81	76	71	70	69	72	74	77	78	79	81	84	86	87	88	88	89	742	56	83	98			
28.5 m							This level was not instrumented for relative humidity at this time																								
26.5 m	91	91	92	92	92	92	87	81	76	71	70	70	72	75	77	77	79	82	85	87	88	88	89	90	742	53	83	99			
13.5 m	91	92	93	93	93	93	88	81	76	70	69	69	71	75	76	77	79	82	85	87	89	90	90	91	742	52	83	100			
8.0 m							This level was not instrumented for relative humidity at this time																								
4.0 m	92	93	93	93	94	94	89	82	77	71	69	68	72	74	75	76	78	81	84	87	88	89	90	91	741	50	83	100			
2.0 m	93	94	95	95	95	95	89	82	77	71	69	69	72	74	76	77	79	82	85	88	89	91	91	92	741	51	84	100			
1.0 m	94	94	95	95	95	95	90	82	77	71	70	69	72	74	76	77	79	83	87	89	91	92	92	93	732	49	85	99			
0.5 m	94	94	95	95	95	95	92	85	78	72	70	70	73	75	77	79	79	82	86	89	90	91	93	93	737	52	85	100			

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MAY 1967

Exposure		Monthly Ranges of Relative Humidity by Hour (%)																								Monthly Summary*	
Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Alt-cook (Forest site)	46.0 m	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF	DTF		
	28.5 m																										
	26.5 m	10	10	9	10	12	10	18	22	26	33	35	36	42	41	44	43	38	34	21	16	15	12	10	16		
	13.5 m	12	11	11	9	7	8	13	20	29	31	33	38	41	43	40	45	45	31	25	19	18	13	12	11		
	8.0 m																										
	4.0 m	14	16	13	10	10	6	13	17	27	30	38	41	39	40	41	42	36	28	25	21	16	14	15	15		
Alta-cook (Forest site)	2.0 m	14	13	13	10	10	8	13	14	24	27	48	41	38	40	40	34	34	24	26	17	16	13	14	12		
	1.0 m	10	11	9	8	8	6	10	12	23	27	39	37	38	38	39	39	38	25	24	18	14	13	11	13		
	0.5 m	9		12	9	6	6	9	14	19	24	28	29	31	30	32	28	26	37	19	16	13	12	10	12		

Note: DTF indicates data of doubtful validity.

* No monthly summary was computed for the ranges.

Alta-cook (Open site)	46.0 m	13	15	14	14	12	15	17	20	20	24	29	36	38	38	41	35	37	30	26	18	15	15	15	13		
	28.5 m																										
	26.5 m	16	16	15	15	14	16	18	19	19	24	32	38	42	42	44	38	38	30	24	18	14	15	15	13		
	13.5 m	15	16	15	15	15	16	20	21	23	26	35	41	44	43	47	40	41	33	27	19	14	15	15	13		
	8.0 m																										
	4.0 m	18	20	16	14	14	15	19	21	23	28	35	42	49	46	50	42	42	33	27	21	17	18	17	16		
Alta-cook (Open site)	2.0 m	18	16	15	14	13	13	19	21	23	28	34	41	44	43	47	40	38	30	24	17	16	17	13	13		
	1.0 m	14	13	13	12	13	12	20	24	27	36	36	42	44	47	49	42	37	30	22	12	13	12	11	12		
	0.5 m	18	16	16	16	16	16	21	25	25	30	38	44	42	46	46	40	33	30	24	17	16	16	18	15		

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MAY 1967

Exposure	Monthly Means ² of other Elements by Hour																								Monthly Summary					
	Site (Code)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Mean	Max.	
Albrook (Forest site)	WB (4.0 m)	74.0	73.9	73.7	73.7	73.5	73.5	74.2	75.6	76.5	77.0	77.6	77.6	77.5	77.7	77.4	76.9	76.6	75.9	75.0	74.9	74.7	74.7	74.5	74.3	744	70.3	75.8	82.7	
	WB (2.0 m)	74.0	73.9	73.8	73.7	73.5	73.5	74.3	76.0	76.7	77.3	77.7	77.9	77.7	78.0	78.0	77.5	77.1	76.8	76.1	75.2	75.0	74.7	74.7	74.5	744	70.1	75.6	81.8	
	WB (0.5 m)	74.4	74.2	74.1	73.9	73.9	73.9	74.3	76.1	77.1	77.1	78.6	78.6	78.6	78.5	78.5	78.5	77.9	77.7	76.8	76.0	75.6	75.3	75.2	74.8	74.7	731	70.5	76.1	81.6
	BP	74.7	731	719	710	710	710	726	745	764	773	777	771	761	740	719	697	688	683	695	707	726	746	764	760	744	744	640	735	800
	P1	0.03	0.04	0.07	0.16	0.62	0.86	0.80	0.01	0.01	0.04	0.06	0.42	0.23	0.20	0.16	0.12	0.21	0.04	0.00	0.01	0.00	0.00	0.02	0.02	56	0.01	0.82	1.27	
	P2	0.03	0.04	0.04	0.06	0.62	1.09	0.06	0.00	0.00	0.00	0.03	0.57	0.09	0.09	0.17	0.09	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	40	0.01	0.60	1.09	
	P3	0.05	0.04	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.92	0.15	0.11	0.24	0.15	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	45	0.01	0.31	1.57	
	P4	0.05	0.04	0.11	0.1	0.04	0.61	0.00	0.00	0.00	0.00	0.07	1.07	0.15	0.13	0.15	0.16	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36	0.01	0.32	1.70	

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WB (4.0 m)	74.1	73.9	73.6	73.6	73.5	73.4	75.2	76.1	76.7	77.2	77.4	77.4	77.4	77.4	77.4	76.6	76.4	76.0	75.5	74.6	74.5	74.4	74.2	74.4	74.3	742	70.4	75.3	80.7
	74.0	73.8	73.5	73.5	73.5	73.4	75.2	76.4	76.8	77.3	77.6	77.6	77.4	77.4	77.3	76.8	76.6	76.1	75.5	74.7	74.6	74.5	74.4	74.3	74.3	742	70.3	75.4	80.3
	74.1	73.9	73.8	73.7	73.6	73.5	75.0	76.6	77.4	78.0	78.3	78.1	77.9	77.9	77.9	77.7	77.4	76.9	76.1	75.2	74.9	74.9	74.6	74.5	74.5	737	70.1	75.8	83.8
	74.2	73.0	714	707	709	717	739	758	768	771	765	765	765	765	765	765	765	765	765	765	765	765	765	765	765	744	735	788	960
WP	0.05	0.10	0.10	0.12	0.07	0.00	0.00	0.02	0.03	0.05	0.25	0.18	0.18	0.12	0.10	0.19	0.06	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	57	0.01	6.09	0.51

WB - Wet bulb temperature (°F)

WP - Barometric pressure (in. of Hg minus 29.0)

PS - Precipitation at 1.0 m. in open area (in.)

P1 - Precipitation at 46.0 m. above canopy (in.)

P2 - Precipitation under full canopy (in.)

P3 - Precipitation under drip canopy (in.)

P4 - Precipitation under open canopy (in.)

² Monthly means of precipitation are computed for precipitation days.

Precipitation totals are substituted for the mean in the monthly summary.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MAY 1967

Exposure		Monthly Ranges ² of other Elements by Hour																								Monthly Summary*	
Site	Code	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
Albrook (Forest site)	WB (4.0 m)	4.0	4.9	4.8	5.2	5.0	4.9	4.2	4.6	4.7	6.6	6.3	5.8	5.5	7.8	6.7	8.1	5.6	4.7	5.0	3.6	3.6	3.5	4.2			
	WB (2.0 m)	4.1	4.8	4.7	5.3	5.0	5.1	4.1	4.8	5.1	8.8	6.5	5.4	5.3	7.3	5.7	7.8	6.0	5.3	4.9	3.7	3.4	3.5	4.1			
	WB (0.5 m)	3.9	4.4	4.8	4.9	5.5	4.6	5.0	4.5	5.2	5.8	5.2	4.8	6.4	5.7	5.6	6.5	7.3	5.9	4.3	3.6	3.8	3.2	4.0			
	BP	.160	.155	.150	.152	.160	.155	.135	.140	.140	.145	.145	.130	.150	.135	.160	.155	.170	.175	.160	.150	.145	.160	.168	.163		
	P1	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.09	1.20	0.87	0.55	0.71	0.23	0.51	0.05	0.00	0.00	0.00	0.00	0.00	0.02		
	P2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.96	0.31	0.18	0.73	0.20	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	P3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	1.41	0.53	0.24	0.90	0.43	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	P4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	1.48	0.52	0.27	0.69	0.52	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

* No monthly summary was computed for the ranges.

Chiva Chiva (Open site)	WB (4.0 m)	4.7	5.2	4.5	5.0	4.6	4.9	3.3	3.7	4.8	5.3	5.4	6.0	4.9	5.3	6.4	7.0	5.5	4.6	4.2	4.1	3.7	3.4	3.2	3.6		
	WB (2.0 m)	4.6	5.0	4.1	4.6	4.5	4.8	3.3	3.5	4.3	4.4	5.2	6.1	4.3	4.7	5.5	5.9	5.5	4.4	4.3	4.1	3.5	3.2	3.3	3.5		
	WB (0.5 m)	4.4	4.7	4.9	5.0	5.2	5.1	4.4	4.1	6.3	7.8	7.4	5.5	6.1	4.6	6.7	6.0	10.0	5.5	4.7	3.9	3.9	3.2	3.7	3.7		
	BP	.160	.160	.160	.155	.160	.155	.145	.160	.145	.150	.150	.140	.125	.125	.150	.135	.175	.185	.165	.165	.140	.150	.155	.155		
	P1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.42	0.40	0.19	0.50	0.27	0.03	0.03	0.00	0.00	0.00	0.00	0.00		
	P2																										

WB - Wet bulb temperature (°F)

BP - Barometric pressure (in. of Hg minus 29.0)

P1 - Precipitation at 4.0 m. in open area (in.)

P2 - Precipitation at 46.0 m. above canopy (in.)

P3 - Precipitation under drip canopy (in.)

P4 - Precipitation under open canopy (in.)

² Monthly ranges of precipitation are computed for precipitation days.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

HOURLY DATA

MAY 1967

Exposure		Monthly Means of Wind Speed by Hour (miles/hr.)																								Monthly Summary						
Site	Level	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	No. of Obs.	Min.	Mean	Max.			
Albrook (Forest site)	46.0 m	3	4	3	3	3	3	3	3	3	4	5	6	5	6	6	6	6	5	5	5	5	5	4	4	744	0	4	15			
	28.5 m								This level was not instrumented for wind speed at this time																							
	26.5 m	1	2	1	1	1	1	2	1	2	2	2	3	2	3	3	3	3	2	2	3	2	2	2	2	744	0	2	10			
	13.5 m								This level was not instrumented for wind speed at this time																							
	8.0 m								This level was not instrumented for wind speed at this time																							
	4.0 m	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	744	0	0	2			
	2.0 m									This level was not instrumented for wind speed at this time																						
1.0 m									This level was not instrumented for wind speed at this time																							
0.5 m									This level was not instrumented for wind speed at this time																							

Chiwa Chiwa (Open site)	46.0 m	8	7	6	6	6	6	6	7	8	8	9	10	10	10	12	10	10	11	9	10	8	9	8	8	7	739	1	8	22												
	28.5 m								This level was not instrumented for wind speed at this time																																	
	26.5 m	5	5	4	4	4	4	4	6	7	7	8	8	8	9	9	8	9	9	7	7	6	6	6	6	5	568	0	6	21												
	13.5 m	2	2	2	1	2	1	2	3	5	5	6	6	7	8	5	5	5	5	5	4	3	3	2	2	2	734	0	4	20												
	8.0 m								This level was not instrumented for wind speed at this time																																	
	4.0 m	3	2	2	2	2	2	2	3	4	5	5	6	6	6	7	6	6	6	5	5	4	4	3	3	3	669	0	4	15												
	2.0 m	1	1	1	1	1	1	1	2	2	3	3	4	4	5	5	3	3	3	2	2	1	1	1	1	1	735	0	2	13												
	1.0 m								This level was not instrumented for wind speed at this time																																	
	0.5 m								This level was not instrumented for wind speed at this time																																	

ALBROOK (Forest site) MAY 1967

		Relative Frequencies* of Wind Directions by Hour at 46.0 m. (%)																							
Dir.	Hr.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N		3.2		3.2					6.4	16.1	16.6	13.3	10.0	3.3	6.4	6.4	3.2	3.2	19.4	6.4	3.2	3.2	6.4	3.2	3.2
NNE											3.3	13.3	3.3	10.0	6.4	6.4	3.2	6.4							
NE											6.6	3.3	6.4	3.3	3.3				3.3						
ENE									3.2	6.4				3.3		3.2									
E										3.2	6.6				3.2										
ESE											3.3						3.2								
SE												6.6													
SSE													3.3	3.2	3.2	3.2									
S												10.0	6.6	13.3	12.9										
SSW										6.4					3.2		3.2								
SW											3.3				6.4	6.4	9.7	6.4							
WSW		9.7	19.4	22.6	6.4	12.9	9.7	3.2	6.4	6.4	6.6	3.3	6.6	3.3	6.4	6.4	9.7	9.7	9.7	9.7	16.3	9.7	19.4	25.8	
W		38.7	41.9	25.8	41.9	25.8	38.7	32.2	25.8	16.1		10.0	16.6	16.6	6.4	22.6	12.9	25.8	19.4	29.0	16.1	25.8	41.9	25.8	32.2
WNW		6.4	12.9	6.4	6.4	6.4	9.7	3.2	6.4	3.2	10.0	6.6	10.0	3.3	16.1	6.4	9.7	16.1	19.4	12.9	22.6	25.8	19.4	15.1	9.7
NW		6.4	6.4	6.4	9.7	12.9	6.4	12.9	9.7	3.2	3.3	3.3	25.3	3.3	6.4	19.4	16.1	16.1	3.2	12.9	16.1	3.2	3.2	9.7	3.2
NNW		3.2		3.2	3.2		3.2	6.4	3.2	6.4	3.3	6.6	3.3	13.3	3.2		3.2		6.4	6.4	6.4	9.7		.4	3.2
CALM		3.2	19.4	32.2	32.2	41.9	32.2	41.9	35.5	32.2	33.2	33.2	13.3	23.3	12.9	16.1	22.6	16.1	19.4	22.6	25.8	16.1	19.4	19.4	22.6

* Note: Due to rounding, percentage totals do not equal 100%.

ALBROOK (Forest site) MAY 1967

		Relative Frequencies* of Wind Directions by Hour at 26.5 m. (%)																							
Dir.	He.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N							3.2			3.2	3.2	16.1	3.2		6.4	3.2			6.4		6.4	3.2			3.2
NNE										6.4	3.2					3.2								3.2	
NE														3.2	3.2		6.4	6.4				3.2			
ENE													3.2												
E											3.2		6.4	3.2	3.2		3.2								
ESE															3.2	3.2									
SE										3.2							3.2								
SSE																									
S									3.2	5.4	22.6	12.9	19.4	16.1	19.4	3.2			3.2						
SSW							3.2		3.2						3.2										
SW										3.2					12.9	9.7		3.2		6.4	3.2		3.2		
WSW										3.2	6.4			3.2		3.2	12.9	3.2	3.2			3.2		3.2	
W	9.7	19.4	16.1	3.2	3.2	3.2	3.2		12.9	6.4		6.4	3.2	3.2	6.4	12.9	9.7	29.0	9.7	9.7	19.4	16.1	9.7	16.1	9.7
WNW	38.7	19.4	12.9	25.8	25.8	25.8	25.8	29.0	22.6	6.4	16.1	6.4	12.9	12.9	6.4	12.9	3.2	9.7	32.2	16.1	16.1	32.2	25.8	19.4	25.8
NW	6.4	16.1	12.9	19.4	6.4	6.4	12.9	19.4	16.1	6.4	12.9	9.7	25.8	12.9	12.9	9.7	16.1	19.4	12.9	41.9	22.6	12.9	35.5	25.8	22.6
NNW		6.4						6.4	6.4	6.4		3.2	3.2	3.2		9.7	16.1	9.7	6.4	3.2	3.2	9.7	3.2		6.4
CAL.M	45.2	32.2	48.4	45.2	48.4	45.2	45.2	45.2	35.5	48.4	32.2	45.2	22.6	41.9	22.6	29.0	29.0	19.4	25.8	22.6	29.0	19.4	22.6	33.2	33.2

* Note: Due to rounding, percentage totals do not equal 100%.

ALBROOK (Forest site) MAY 1967

Relative Frequencies* of Wind Directions by Hour at 4.0 m. (%)																								
Dir.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	3.2																3.2							
NNE												3.2												
NE													3.2		3.2		3.2							
ENE																	3.2							
E										3.2														
ESE																								
SE											3.2					3.2								
SSE																		3.2						
S									3.2	6.4	6.4	9.7	3.2	3.2										
SSW																		3.2						
SW																								
WSW																	6.4							
W		3.2									3.2							3.2		3.2				
WNW											6.4					3.2								
NW	3.2				3.2	3.2									3.2	3.2					3.2			3.2
NNW																				3.2				
CALM	93.5	96.8	100.0	100.0	96.8	96.8	100.0	100.0	96.8	90.3	83.9	87.1	93.5	96.8	93.5	87.1	83.9	93.5	96.8	93.5	96.8	100.0	100.0	96.8

* Note: Due to rounding, percentage totals do not equal 100%.

CHIVA CHIVA (Open site) MAY 1967

Relative Frequencies* of Wind Directions by Hour at 46.0 m. (%)																								
Hr. Dir.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	3.2	3.2	3.3		3.3		6.6		9.7	9.7	9.7	9.7	12.9	3.2	9.7	9.7	6.4		6.4	3.2	3.2	3.2	3.2	6.4
NNE						3.3	3.3			6.4	6.4	6.4	3.2	3.2	6.4			3.2		3.2			3.2	
NE					6.6			3.2			3.2	3.2	12.9	6.4	3.2			3.2						
ENE					3.3																			
E				3.3										6.4	3.2									
ESE								3.2			3.2		3.2	3.2	3.2									
SE											3.2	6.4	3.2	6.4		3.2								
SSE																								
S			3.3	3.3				3.2		3.2		3.2	9.7	3.2			3.2							
SSW	6.4								3.2	9.7				3.2		6.4				3.2	3.2			
SW	3.2	3.2	6.6	3.3	3.3					6.4		6.4	3.2	6.4	6.4									
WSW	3.2	6.4	6.6		10.0				3.2	3.2	3.2	6.4			6.4	3.2					3.2			
W	6.4	12.9	6.6	13.3		3.3	6.6	9.7	6.4	9.7	12.9	9.7	3.2	9.7	6.4	9.7	3.2		3.2		6.4			3.2
WNW	12.9	9.7	16.6	13.3	16.6	26.7	23.3	16.1	16.4	9.7	9.7	16.1	19.4	3.2	16.1	22.6	22.6	16.1	12.9	3.2	3.2	9.7	16.1	22.6
NW	48.4	51.6	43.2	46.6	46.3	43.2	39.9	48.4	5	32.2	25.8	22.6	3.2	25.8	16.1	29.0	58.1	61.3	61.3	61.3	58.1	61.3	48.4	51.6
NNW	16.1	12.9	13.3	16.6	10.0	22.3	20.0	19.4	19.4	16.1	12.9	9.7	25.8	19.4	22.6	16.1	6.4	16.1	16.1	25.8	29.0	19.4	29.0	16.1
CALM																								

* Note: Due to rounding, percentage totals do not equal 100%.

CHIVA CHIVA (Open site) MAY 1967

		Relative Frequencies* of Wind Directions by Hour at 26.5 m. (%)																							
Hr.	Dir.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	N	3.3	16.6		6.6	16.6	16.6	23.3	6.8	20.0	19.4	19.4	16.6	10.0	16.6	20.0	16.6	20.0	20.0	33.2	23.3	23.3	20.0	29.9	16.6
	NNE								6.8	10.0	3.2	6.4	10.0	6.6	6.6	10.0	3.3	3.3	6.6	3.3		3.3	6.5		6.6
	NE		3.3			3.3	3.3	3.3	3.4	3.3	9.7	9.7	3.3	16.6	6.6	10.0	3.3	3.3	3.3		3.3	6.6			
	ENE					10.0							3.3	3.3	3.3										
	E											3.2			3.3	3.3									
	ESE				3.3							3.2		3.3	3.3									6.6	
	SE											6.4	10.0		6.6	3.3									3.3
	SSE		3.3			3.3								3.3			3.3								
	S					3.3		3.3			6.4	3.2		10.0	3.3		3.3	3.3	6.6						
	SSW		3.3									3.2								3.3			3.3		
	SW	6.6		6.6	3.3	6.6	3.3	3.3			3.2			3.2	3.3						3.3	3.3			
	WSW	6.6		3.3		3.3			3.4				6.6		3.3	6.6	3.3					3.3			
	W	6.6	6.6	3.3	16.6	3.3	3.3	6.6	3.4	6.6	3.2	6.4		3.3	6.6	3.3	10.0	3.3		3.3	3.3		3.3	10.0	6.6
	WNW	10.0	13.3	16.6	13.3	6.6	10.0	6.6	3.4	16.6	9.7	6.4	16.6	10.0	6.6	3.3	3.3	6.6		6.6	3.3	3.3	3.3	6.6	
	NW	23.3	26.6	13.3	20.0	16.6	33.2	29.9	37.6	10.0	6.4	9.7	10.0	10.0	12.3	20.0	36.6	26.6	16.6	3.3	23.3	23.3	23.3	13.3	20.0
	NNW	43.2	26.6	49.8	36.6	20.0	23.3	20.0	34.1	33.2	38.7	22.6	23.3	20.0	16.6	20.0	16.6	33.2	46.6	46.6	39.9	33.2	39.9	33.2	46.6
	CALM			6.6		3.3	6.6	3.3																	

* Note: Due to rounding, percentage totals do not equal 100%.

CHIVA CHIVA (Open site) MAY 1967

Relative Frequencies* of Wind Directions by Hour at 4.0 m. (%)																								
Dir.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
N	6.4	3.2	3.2	6.4	6.4	9.7	6.5	9.7	9.7	9.7	10.0	3.3	6.6	9.7	12.9	3.2	3.2	12.9	9.7	12.9	16.1	9.7	6.4	3.2
NNE	3.2		6.4	3.2		3.2	3.3		3.2	6.4		3.3	10.0	3.2	12.9	3.2			3.2		3.2			6.4
NE			6.4	6.4	6.4					6.4	10.0	6.6	10.0	6.4	3.2	3.2	3.2			3.2		3.2		
ENE		6.4						3.2			3.3	3.3		3.2										
E											3.3	3.3											3.2	
ESE				3.2							3.3		3.3	6.4										
SE		3.2			6.4	3.2			3.2			6.6		3.2		3.2	3.2							3.2
SSE	3.2					3.2							3.3											
S	6.4				6.4				3.2	9.7		3.3	10.0	6.4		3.2		3.2		3.2	3.2			
SSW	6.4		3.2		3.2	3.2		3.2	3.2		3.3				3.2							3.2		3.2
SW			12.9	9.7	6.4	6.4	3.3	3.2		3.2	10.0	3.3	6.6		6.4	6.4					3.2	3.2		3.2
WSW		3.2					10.0	3.2	6.4	9.7	6.6	6.6		9.7	6.4	6.4	3.2		6.4	3.2	3.2	3.2	3.2	3.2
W	6.4	6.4	6.4	12.9	3.2	3.2	3.3		12.9		10.0	10.0	6.6		3.2	9.7	3.2	9.7	3.2	6.4		3.2	9.7	3.2
WNW	12.9	9.7	9.7	12.9	6.4	3.2	20.0	25.8	6.4	6.4	6.6	13.3	6.6	16.1	16.1	16.1	19.4	9.7	9.7	16.1	9.7	12.9	9.7	9.7
NW	32.2	32.2	32.2	22.6	19.4	38.7	16.6	29.0	32.2	38.7	16.6	23.3	20.0	17.9	12.9	22.6	32.2	45.2	41.9	32.2	41.9	48.4	32.2	41.9
NNW	19.4	19.4	6.4	12.9	12.9	6.4	20.0	22.6	19.4	9.7	16.6	13.3	16.6	19.4	19.4	19.4	32.2	19.4	25.8	19.4	16.1	12.9	25.8	19.4
CALM	3.2	16.1	12.9	9.7	22.6	19.4	16.6							3.2	3.2	3.2				3.2		3.2	6.4	3.2

* Note: Due to rounding, percentage totals do not equal 100%.

SUMMARY OF NON HOURLY DATA

MAY 1967

Summary of Elements with Non-hourly Frequencies of Observation						
Site	Element, Units and Exposure	Description	Number of Obs.	Minimum Value	Mean or Total Value	Maximum Value
Alroon (Forest site)	WBG Index ¹ (at 1.0 meters)	Index value	426	70.7	78.0	84.6
		Dry bulb temp.	426	71.0	79.6	91.5
		Wet bulb temp.	426	70.5	77.1	84.5
		Black bulb temp.	426	71.1	80.5	91.5
	Evaporation ³ (in. at 4 levels)	Piche (46.0 m)	31	0.079	10.370*	0.659
		Piche (26.5 m)	31	0.049	7.606*	0.573
		Piche (13.5 m)	29	0.006	3.087*	0.232
		Piche (0.5 m)	29	0.006	1.521*	0.159
	Precipitation from Raingauge Network ² (in. at 1.0 meters)	Gauge # 1	21	0.01	8.27*	1.55
		Gauge # 2	23	0.01	9.33*	1.55
		Gauge # 3	24	0.01	11.07*	1.75
		Gauge # 4	23	0.01	12.05*	2.36
		Gauge # 5	23	0.01	9.33*	1.25
		Gauge # 6	23	0.01	10.22*	1.60
		Gauge # 7	24	0.01	8.84*	1.61
		Gauge # 8	22	0.01	8.53*	1.45
	Stem Flow ²	Small tree	20	0.01	8.60*	1.47
		Medium tree	19	0.01	8.83*	1.54
		Large tree	17	.01	238.29*	154.37
Clava Clava (Open site)	WBG Index ¹ (at 1.0 meters)	Index value	419	69.7	80.4	90.1
		Dry bulb temp.	419	70.0	82.3	94.6
		Wet bulb temp.	419	69.7	77.2	82.0
		Black bulb temp.	419	69.1	90.8	121.3
	Evaporation ³ (in. at 0.5 meters)	Piche	31	0.049	6.901*	0.518
		Pan	31	0.013	5.331*	0.363
	Minimum Grass temp ³ (°F at grass tips)	None	23	68.1	72.8	75.7

1 - Hourly observations between 0600 and 1900 hours inclusive

* Total Values

2 - Six hourly observations

3 - Daily observations

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)

US Army Tropic Test Center
Fort Clayton, Canal Zone

2a. REPORT SECURITY CLASSIFICATION

UNCLASSIFIED

2b. GROUP

3. REPORT TITLE

Monthly Microclimatic Summary, May 1967: Environmental Data Base for Regional Studies
in the Humid Tropics

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Data Summary, May 1967

5. AUTHOR(S) (First name, middle initial, last name)

6. REPORT DATE

September 1967

7a. TOTAL NO. OF PAGES

27

7b. NO. OF REFS

8a. CONTRACT OR GRANT NO.

8b. ORIGINATOR'S REPORT NUMBER(S)

a. PROJECT NO. 2M025001A724-01

c. USATECOM No. 9-4-0013-01

d. Work Unit: USATTC #001

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned
this report)

10. DISTRIBUTION STATEMENT

Distribution of this document is unlimited

11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY

Advanced Research Projects Agency
Army Research Projects Office, OCRD

13. ABSTRACT

This report contains detailed microclimatic data for May 1967 from specific sites in the Panama Canal Zone and vicinity. The data are presented in tabular form, summarized for hourly and/or daily observations from surface to 46-meter levels. Elements listed are: temperature, pressure, precipitation, wind speed and direction, relative humidity, and evaporation.

DD FORM 1473

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OBSOLETE FOR ARMY USE.

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Climate Microclimatology Tropic Environment Humid Tropics Panama Canal Zone Microclimatology Data Base						

UNCLASSIFIED

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